IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Bharti Temkin, et al. Group Art Unit: 2673
Serial Number: 09/844,881 Confirmation No.: 1751
Filed: April 28, 2001
For: DEVELOPMENT OF STEREOSCOPIC-HAPTIC VIRTUAL ENVIRONMENTS

DECLARATION OF DR. BHARTI TEMKIN

Bharti Temkin of Ransom Canyon, Texas, co-inventor/co-applicant of the above identified application states:

1. I have conducted research in virtual environments including haptics (force feedback), per se and in relation to visual and sound displays-projections, for many years. My c.v. appears at Appendix A hereto. This work was performed at Texas Tech University. The identified co-inventors, Kirk Watson and Eric Acosta, and many other graduate students and research associates over the years, worked under my direction.

2. I have alone and with other authors, published several papers describing our work including those set forth at "Other Documents," nos. B1, 2, 3, *et seq.* in the Information Disclosure Statement filed 8 March 2002 in the above identified application. A full listing of my papers is provided at Appendix B, hereto.

3. The reference, Watson, K. *et al.*, "Development of Haptic Stereoscopic Virtual Environments," Proc. 12th Symp. IEEE/Computer-Based Medical Systems CBMS, June 19-20, 1999, cited against claim 1 of the application in the PTO action of 20 March 2003 is one of those papers. The named authors are myself, plus two of the co-inventors (Temkin, Watson) and also Dr. LeRoy Heinrichs and Dr. Thomas Krummel, then and now of Stanford University Medical Center and School of Medicine, respectively, and Dr. Paul J. Gorman, then of Penn State Geisinger Health System.

4. The subject matter common to the reference and the invention of the present application was made by me. The invention recited in the claims of this application was made by me with co-inventors Watson and Acosta. Co-authors Heinrichs, Krummel and Gorman contributed to the paper's discussion of the significance of my work (alone and with Watson,

Acosta and others) in the context of application to medical surgery uses. Dr. Heinrichs also contributed a 3D surface model of organs from the Stanford Visible Human Lucy 2.0. Drs. Heinrichs, Krummel and Gorman are not co-inventors of the invention set forth in claims 2-6 attached hereto or of any expression of the invention in the Watson *et al.* paper. The valuable work that they did previously and made available for use in work leading to the paper was a building block but not the invention per se. The combined stereoscopic-haptic work was that of Watson, Acosta and myself.

5. I visited Dr. Krummel at Hershey Medical Center (Surgery Department) in Spring/Summer of 1998. He had funded a student for me for the academic year 1998-1999. Dr. Gorman had visited my department at Texas Tech University in Summer 1998, and Dr. Kummel had visited us in 1999. Dr. Gorman worked under Dr. Krummel. I visited Dr. Heinrichs in Summer 1998 at Stanford University. Dr. Heinrichs gave us the Lucy 2.0 model in Spring 1999. Dr. Heinrichs and his associate (Ramani Pinchumani) visited us in Spring 2000. I had many telephone conversations with some of these colleagues circa 1998-1999. The Watson K. *et al.* paper and related papers were also completely written at Texas Tech University. There were no exchanges before publication regarding the content.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United State Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 9/15, 2003 By: Bharti Temkin

Bharti Temkin, PhD, co- Applicant

I agree with the above description insofar as it includes matters within my knowledge.

_____ Date: _____
William LeRoy Heinrichs, MD, Ph.D.

_____ Date: _____
Thomas M. Krummel, MD

_____ Date: _____
Paul J. Gorman, MD

12001-104-BT_Decl-091203

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Education

Degree	Major	Institution
Ph.D.	Mathematics	City University of New York(Advisor: Prof. L. Auslander)
M.S	Mathematics	City University of New York
B.S	Mathematics	London University

Professional Appointments

September 2002-May 2002, Sabbatical at MIT.

August 1996-present, Computer Science Department, Texas Tech University.

June 2001-present, Research Professor, Surgery Department of Texas Tech University, Health Science Center.

1995-1996, Research Faculty in Electrical Engineering Department, Colorado State University; software robustness, crystal growth simulations.

1983-1992 Member of Technical Staff at AT&T Bell Laboratories, design and implementation of real time applications, including abstract computational and process models, design and evaluation of algorithms, design of large databases and data analysis system prototypes for AT&T business sector. Responsible for development of training courses for high visibility projects.

1979-1983, Resident Visitor, Research Division of AT&T Bell Labs, Murray Hill, N.J. Research in combinatorial number theory. Solved a long-standing problem in number theory, a Linear Diophantine Problem of Frobenius. Frobenius solved the problem in 1870s for two variables. I solved the problem for three variables and various other related problems in 1983.

1970-1975, Mathematics Instructor at City College, Queen's College - CUNY, and Mills College of Education in New York City.

Awards

AT&T Bell Laboratories President's Quality Award, 1991 for successful completion of the Enhanced Modular Signal Processor Project.

AT&T Bell Laboratories Statistic Day Award, 1984, for the design and implementation of the Market Analysis Database Interface System (MADIS).

Special Effort

Established an interaction between Computer Science and Surgery Departments to develop virtual reality training theater for surgery specific anatomy and laparoscopic surgical techniques. This includes haptics, stereoscopic vision, and voice recognition components.

Professional Membership

Institute of Electrical and Electronics Engineers (IEEE)
Society of Women Engineers (SWE)
Association of Computing Machinery (ACM)

Selected Recent Publications

1. Temkin, B., Acosta E., Hatfield P, Onal E., and Tong, A. Web-based Three-dimensional Virtual Body Structures: W3D-VBS. J. Am. Med. Inform. Assoc. 2002; 9(5): 425-436
2. Eric Acosta, Bharti Temkin, "Touch&Tell: A game-based tool for learning to use the PHANToM", Seventh *PHANToM Users Group Workshop (PUG2002)* - October 2002.
3. Bharti Temkin, Paul Hatfield, Eric Acosta, "PC based Visible Human Volumizer", *The fourth Visible Human Project Conference*, Oct 17-19, 2002.
4. Parvati Dev, W. LeRoy Heinrichs, Sakti Srivastava, Kevin N. Montgomery, Steven Senger, Bharti Temkin, Chris Hasser, Jean-Claude Latombe, Jean Heegaard, Patricia Youngblood, Charles P. Friedman, Kenneth Waldron "Simulated Learning Environments in Anatomy and Surgery Delivered via the Next Generation Internet", *Medinfo 2001, Tenth World Congress on Health and Medical Informatics*, Sept 2-5, 2001.
5. B. Temkin, C. Stanley, "Networked Stereoscopic Virtual Environment System", *14th IEEE Symposium on Computer-Based Medical Systems 2001*, July 26th-27th, pages 400-406, ISBN 0–7695–1004–3.
6. Eric Acosta, Bharti Temkin, John A. Griswold, Sammy A. Deeb, Randy S. Haluck, "Haptic Texture Generation – A Heuristic Method For Virtual Body Structures", *14th IEEE Symposium on Computer-Based Medical Systems 2001*, July 26th-27th, pages 395-399, ISBN 0–7695–1004–3.
7. Bharti Temkin, Bryan Stephens, Eric Acosta, Bin Wei, Paul Hatfield, Texas Tech University, Lubbock, TX, "Haptic Virtual Body Structures", *The Third Visible Human*

Project Conference, Sponsored by the National Library of Medicine. Oct 2000. CD-ROM, ISSN – 1524-9008

8. Eric Acosta, Bharti Temkin, Thomas M. Krummel, Wm. LeRoy Heinrichs, "G_2H – Graphics-to-Haptic Virtual Environment Development Tool for PC's", Medicine Meets Virtual Reality – MMVR 2000

9. Kirk Watson, Bharti Temkin, Ph.D., Wm. LeRoy Heinrichs, Thomas M. Krummel, Paul J. Gorman, "Development of Stereoscopic-Haptic Virtual Environments", 12th IEEE Symposium on Computer-Based Medical Systems - CBMS 1999, June 18-20, pages 29-34, ISBN 0–7695–0234–2.

PUBLICATIONS

1. Temkin, B., Acosta E., Hatfield P, Onal E., and Tong, A. Web-based Three-dimensional Virtual Body Structures: W3D-VBS. J. Am. Med. Inform. Assoc. 2002; 9(5): 425-436 (put URL here)

2. Eric Acosta, Bharti Temkin, "Touch&Tell: A game-based tool for learning to use the PHANToM", Seventh *PHANToM Users Group Workshop (PUG2002)* - October 2002.

3. Bharti Temkin, Paul Hatfiled, Eric Acosta, "PC based Visible Human Volumizer", *The fourth Visible Human Project Conference*, Oct 17-19, 2002. (IS there a CD for this?)

4. Bharti Temkin, Paul Hatfield, John A. Griswold, Sammy A. Deeb, Parvati Dev, W. LeRoy Heinrichs, Sakti Srivastava, Kenneth Waldron, "Volumetric Virtual Body Structures", *Medicine Meets Virtual Reality: 10 Digital Upgrades: Applying Moor's Law to Health,* January 23-26, 2002.

5. Bharti Temkin, Eric Acosta, John A. Griswold, Sammy A. Deeb, Randy S. Haluck, Louis R. Kavoussi, "Force Feed back Modeling with Heuristic Haptic Texture Using Virtual Body Structures", *Medicine Meets Virtual Reality: 10 Digital Upgrades: Applying Moor's Law to Health,* January 23-26, 2002.

6. Eric Acosta, Bharti Temkin, "Scene Complexity: A measure for real-time stable haptic applications", *"Sixth PHANToM Users Group Workshop (PUG2001)"* - October 27-30, 2001.

7. Parvati Dev, W. LeRoy Heinrichs, Sakti Srivastava, Kevin N. Montgomery, Steven Senger, Bharti Temkin, Chris Hasser, Jean-Claude Latombe, Jean Heegaard, Patricia Youngblood, Charles P. Friedman, Kenneth Waldron "Simulated Learning Environments in Anatomy and Surgery Delivered via the Next Generation Internet", Medinfo 2001, Tenth World Congress on Health and Medical Informatics, Sept 2-5, 2001

8. Christopher Stanley, Bharti Temkin, Dept. of Computer Science Texas Tech University, Parvati Dev, W. LeRoy Heinrichs, Sakti Srivastava, Kenneth Waldron, SUMMIT (Stanford University Medical Media and Information Technologies), Stanford University School of Medicine, "Networked Stereoscopic Virtual Environment System", 14th IEEE Symposium on Computer-Based Medical Systems 2001, July 26th-27th.

9. Eric Acosta, Bharti Temkin, Dept. of Computer Science, Texas Tech University, John A. Griswold MD, Sammy A. Deeb MD, Dept. of Surgery, Texas Tech University

Health Science Center, Randy S. Haluck, MD, Penn State Geisinger Health System, "Haptic Texture Generation – A Heuristic Method For Virtual Body Structures", 14th IEEE Symposium on Computer-Based Medical Systems 2001, July 26th-27th.

10. W.L.Heinrichs, MD, PhD1, Sakti Srivastava, MD[2], Joel Brown[5], J-C Latombe, PhD[5], Kevin Montgomery, PhD[3], B. Temkin, PhD[4], Parvati Dev, PhD [6], Departments of Gynecology and Obstetrics[1], Surgery (Anatomy)[2], Functional Restoration[3], Medicine (Medical Information Sciences) [6], Computer Science[5], and SUMMIT (Stanford University Medical Media and Information Technologies) [1,2, 6] Stanford University School of Medicine, Stanford, CA 94305, and Texas Tech University[4], Lubbock, TX, "A Stereoscopic Palpable and Deformable Model: Lucy 2.5", The Third Visible Human Project Conference, Sponsored by the National Library of Medicine, Oct 2000.

11. Bharti Temkin, Bryan Stephens, Eric Acosta, Bin Wei, Paul Hatfield, Texas Tech University, Lubbock, TX, "Haptic Virtual Body Structures", The Third Visible Human Project Conference, Sponsored by the National Library of Medicine, Oct 2000.

12. Eric Acosta, Bharti Temkin, Dept. of Computer Science Texas Tech University, Wm. LeRoy Heinrichs, MD, Ph.D. Dept. of Gynecology and Obstetrics, Stanford Univ. Medical Center, Thomas M. Krummel, MD, Department of Surgery, Stanford University School of Medicine, "G_2H – Graphics-to-Haptic Virtual Environment Development Tool for PC's", Medicine Meets Virtual Reality: 8 The Convergence of Physical & Informational Technologies: Options for a New Era in Healthcare January 27-30, 2000

13. Bryan Stephens, Bharti Temkin, Dept. of Computer Science Texas Tech University, Wm. LeRoy Heinrichs, MD, Ph.D. Dept. of Gynecology and Obstetrics, Stanford Univ. Medical Center, Thomas M. Krummel, MD, Department of Surgery, Stanford University School of Medicine, "Virtual Body Structures: A 3D Structure Development Tool from Visible Human Data", Medicine Meets Virtual Reality: 8 The Convergence of Physical & Informational Technologies: Options for a New Era in Healthcare January 27-30, 2000

14. Kirk Watson, Bharti Temkin, Ph.D., Wm. LeRoy Heinrichs, Thomas M. Krummel, Paul J. Gorman, "Development of Stereoscopic-Haptic Virtual Environments", 12th IEEE Symposium on Computer-Based Medical Systems - CBMS 1999

15. Farida Vahora, Bharti Temkin, Ph D., Dept. of Computer Science Texas Tech University, Thomas M. Krummel, MD, Department of Surgery, Stanford University School of Medicine, Paul J. Gorman, Dept. of Surgery, Penn State Geisinger Health

System, "Development of Real -Time Virtual Reality Haptic Application: Real-Time Issues", 12th IEEE Symposium on Computer-Based Medical Systems - CBMS 1999

16. Eric Acosta, Bryan Stephens, Bharti Temkin, Ph.D., Dept. of Computer Science Texas Tech University, Thomas M. Krummel, MD, Department of Surgery, Stanford University School of Medicine, Paul J. Gorman, MD, Department of Surgery, Penn State Geisinger Health System, John A. Griswold MD, Sammy A. Deeb MD, Dept. of Surgery, Texas Tech University Health Science-Center, "Development of a Haptic Virtual Environment", 12th IEEE Symposium on Computer-Based Medical Systems - CBMS 1999

17. Farida VAHORA, Bharti Temkin, William Marcy, Texas Tech University, Paul J. Gorman, MD, Thomas M. Krummel, MD, Dept. of Surgery, Penn State Geisinger Health System, Wm. LeRoy Heinrichs, MD, Ph.D., Dept. of Gynecology and Obstetrics, Stanford U. Medical Center, "Virtual reality and Women's Health: A haptics-guided, breast biopsy system", Medicine Meets Virtual Reality: 7 The Convergence of Physical & Informational Technologies: Options for a New Era in Healthcare January 20-23, 1999, sponsored by Stanford University School of Medicine.

18. V. V. Poceciun and B. Temkin, PhD, Texas Tech University, Lubbock, TX, M. Dean Ethridge, PhD, and E. Hequet, International Textile Center, Texas Tech University, Lubbock, TX "Integration of Advanced Computer Technology into COTTON ANALYSIS AND QUALITY CONTROL", Beltwide Cotton Conference, Jan, 3-7 1999

19. V. V. Poceciun and B. Temkin, Ph.D., Texas Tech University, Lubbock, TX, "Computerized Collection and Analysis of HVI Data", Beltwide Cotton Conference, Jan, 3-7 1999

20. Geoff Marcy, Bharti Temkin Department of Computer Science Texas Tech University Paul J. Gorman, Thomas M. Krummel Penn State University College of Medicine, "Tactile MAX: A Haptic Interface for 3D Studio MAX", MIT (Massachusetts Institute of Technology, Cambridge, MA) sponsored conference: "The Third PHANToM Users Group Workshop *(PUG98)"* - October 3-6, 1998

21. Jon Burgin (1), Bryan Stephens (2), Farida Vahora (2), Bharti Temkin (2), William Marcy (2), Paul Gorman (3), Thomas Krummel (3). (1) On Board Software Inc., (2) Texas Tech University, (3) Penn State University College of Medicine, "Haptic Rendering of Volumetric Soft-Bodies Objects", MIT (Massachusetts Institute of Technology, Cambridge, MA) sponsored conference: "The Third PHANToM Users Group Workshop *(PUG98)"* - October 3-6, 1998